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SEP 26 2006

REMARKS

Claims 1-6, 9-12 and 14-20 are pending in this application. Claims 1, 9-10 and 14 are amended herein and claims 7-8 and 13 are canceled herein. No new matter has been added.

Applicant respectfully requests reconsideration of the claims in view of the following remarks.

Claims 1-2, 4, 7-11, 14-18, and 20 have been rejected under 35 U.S.C. § 102(b) as being anticipated by Ohki (U.S. Patent No. 6,143,59, hereinafter "Ohki"). Other dependent claims have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Ohki in view of additional prior art. Applicant respectfully traverses these rejections.

The Examiner considers Ohki to disclose or teach all of the features of claims 1 to 2, 4, 7 to 11, 14 to 18 and 20 of the present application. Applicant submits that each and every element is set forth in the claims 1 to 2, 4, 7 to 11, 14 to 18 and 20 is not found, either expressly or inherently, in Ohki. Thus, the cited reference does not anticipate the claimed invention.

The present invention as defined in independent claim 1 relates to:

A semiconductor package comprising:
a substrate,
an integrated circuit mounted on the substrate,
a heat conductive plate having a portion interposed between the integrated circuit and the substrate, the heat conductive plate being heat-conductively connected to the integrated circuit and having at least one portion extending laterally out from between the integrated circuit and the substrate; and
a second integrated circuit disposed between the plate and the substrate, the plate being in heat-conductive contact with the second integrated circuit, whereby heat generated by the second integrated circuit is conducted away from the second integrated circuit by the plate.

The Examiner asserts that the leads 237 in Ohki constitute "at least one portion [of the heat conductive plate] extending laterally out from between the integrated circuit and the substrate." The Examiner also refers to Figures 12 and 13. Applicant does not agree and traverses the Examiners assertion as follows.

Clearly the leads 237 are not part of the heat radiating system described in Ohki. The heat radiating system for the CPU and CMU in Ohki is described in column 19 line 60 to column 20 line 7. Leads 237 do not extend laterally out from between the integrated circuit and the substrate. In any event, leads 237 are not a portion of ceramic base board 240.

Similarly Ohki does not disclose the additional limitations of original claims 7 and 8 now incorporated into currently amended claim 1. The heat radiating system in Ohki for the SRAM chips is described at column 20 lines 8 to 21.

The required elements of currently amended claim 1 are not found in Ohki. Accordingly, Applicant submits that currently amended claim 1 is not anticipated by Ohki.

The present invention as defined in independent claim 10 relates to:

A method of forming a plurality of semiconductor packages, the method comprising:

- securing a heat-conductive plate over a substrate,
- mounting a plurality of integrated circuits over the heat-conductive plate with a heat-conductive connection therebetween, the heat conductive plate having at least one portion extending laterally out from between the integrated circuit and the substrate, the plate extending between each of the integrated circuits and the substrate; and

- cutting the substrate and the plate to produce a plurality of semiconductor packages each including at least one of the integrated circuits.

The Examiner asserts that the leads 237 in Ohki constitute an element of the heat conductive plate which extend laterally out from between the integrated circuit and the substrate.

The Examiner also refers to Figures 12 and 13. Applicant does not agree and traverses the Examiner's assertion as follows.

Applicant submits the relevant portion of Ohki is in fact Figure 14 and column 15 lines 17 to 64.

Clearly the leads 237 are not part of the heat radiating system described in Ohki. The heat radiating system of the CPU and CMU in Ohki is described at column 15 lines 24 to 31. Circuit board 231 is not heat-conductively connected to the CPU and CMU. Leads 237 do not constitute a portion of a heat conductive plate. Leads 237 do not extend laterally out from between the integrated circuit and the substrate. The leads 237 are not a portion of circuit board 231.

In any event the Examiner also asserts that original claim 13 is not anticipated by Ohki. Accordingly, since the additional limitations of original claim 13 are now incorporated into currently amended claim 10, currently amended claim 10 is also not anticipated by Ohki.

The present invention as defined in independent claim 14 relates to:

A packaged semiconductor device comprising:
a substrate including a plurality of contact regions on an upper surface;
a heat conductive plate mounted over the substrate, the heat conductive plate comprising a central portion and a plurality of arms extending outwardly from the central portion, one or more of the arms extending laterally outwardly from a side surface of the central portion of the plate;
an integrated circuit having a bottom surface mounted over the central portion of the heat conductive plate; and
a plurality of electrical connections between an upper surface of the integrated circuit and the contact regions of the substrate, the electrical connections extending between adjacent ones of the arms of the heat conductive plate.

The Examiner asserts that the leads 237 in Ohki constitute an arm element of the heat conductive plate which extend outwardly from a central portion. The Examiner asserts that a plurality of electrical connections extend between the leads 237 to the substrate. Applicant does not agree and traverses the Examiner's assertion as follows.

Clearly in Ohki the leads 237 are not part of the heat radiating system described in Ohki. The heat radiating system in Ohki is described at column 15 lines 24 to 31. Leads 237 do not

constitute a portion of a heat conductive plate. Leads 237 do not extend outwardly from the central portion. In any event leads 237 are not a portion of circuit board 231.

The bond wires 250 in Ohki do not extend between the leads 237, but instead terminate on them. In fact the leads 237 are obviously part of the electrical system and not the heat radiating system.

Similarly Ohki does not disclose the additional limitations of original claim 17, elements of which are incorporated into currently amended claim 14. In relation to previously presented claim 17 the Examiner asserts that the leads 237 are lateral arms extending outwardly from a side surface of the central portion of the circuit board 231. In relation to newly amended claim 14 Applicant does not agree and traverses the Examiners assertion as follows.

The leads 237 do not extend laterally outwardly from a side surface of the central portion of the circuit board 231. The leads 237 are not a portion of circuit board 231.

The required elements of currently amended claim 14 are not found in Ohki. Accordingly, Applicant submits that currently amended claim 14 is not anticipated by Ohki.

Claims not specifically mentioned above depend from one of claims 1, 10 or 14 and add further limitations. It is respectfully submitted that these dependent claims are allowable by reason of depending from an allowable claim as well as for adding new limitations.

For example, claims 3 and 13 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Ohki in view of Moden (US Patent No. 6303981). More specifically, the Examiner has objected to dependent claims 3 and 13 as he considers these claims to be obvious in light of a combination of the teachings of Ohki and Moden.

The comments above in relation to newly amended claims 1 and 10 are reiterated in relation to claims 3 and 13.

In relation to claim 3 the Examiner has asserted that in Ohki the leads 237 extend laterally from the circuit board 231 with openings between them. The Examiner has asserted that in Moden the lead frame 18B constitutes a substrate and therefore that the bond wires 36A pass from the die 16A through an opening in the leadframe. Applicant does not agree and traverses the Examiners assertion as follows.

Moden does not provide any of the features lacking in Ohki. In both citations the bond wires are attached to the leadframe. In neither case do the bond wires pass through openings between arms of a heat conductive plate.

The required elements of previously presented claim 3 are not found in Ohki or Moden or any valid combination thereof. Accordingly Applicant submits that previously presented claim 3 is non obvious over Ohki in view of Moden.

In relation to original claim 13 the Examiner has asserted that in Moden there is a singulation step in Figure 4A-4E. The limitations of original claim 13 are incorporated into newly amended claim 10. Therefore in relation to newly amended claim 10 Applicant does not agree and traverses the Examiners assertion as follows.

Moden does not provide any of the features lacking in Ohki. Neither citation discloses a heat conductive plate extending laterally out from between a plurality of integrated circuits and the substrate. Neither citation discloses cutting such a plate and the substrate to form a plurality of semiconductor packages. The leadframe asserted by the Examiner is simply that, it is not a substrate or a heat conductive plate.

The required elements of newly amended claim 10 are not found in Ohki or Moden or any valid combination thereof. Accordingly Applicant submits that newly amended claim 10 is non obvious over Ohki in view of Moden.

Claim 6 stands rejected under 35 U.S.C. 103(a) as being unpatentable over Ohki in view of Ohsawa et al. (US Patent Publication No. 2002/0031862, hereinafter "Ohsawa"). More specifically, the Examiner has objected to dependent claim 6 as he considers this claim to be obvious in light of a combination of the teachings of Ohki and Ohsawa.

The comments above in relation to newly amended claim 1 are reiterated in relation to previously presented claim 6.

Ohsawa does not provide any of the features lacking in Ohki. The Examiner asserts that in Ohsawa the interconnect 2 and thicker outer leads 3 extend laterally outward from the LSI chip

7. Applicant does not agree and traverses the Examiners assertion as follows.

Ohsawa does not provide any of the features lacking in Ohki. Neither citation discloses a heat conductive plate extending laterally out from between an integrated circuit and the substrate. The leads of either citation do not comprise part of a heat conductive plate.

The required elements of previously presented claim 6 are not found in Ohki or Ohsawa or any valid combination thereof. Accordingly, Applicant submits that previously presented claim 6 is non obvious over Ohki in view of Ohsawa.

Claim 5 stands rejected under 35 U.S.C. 103(a) as being unpatentable over Ohki in view of Joshi (US Patent No. 4,069,498). More specifically, the Examiner has objected to dependent claim 5 as he considers this claim to be obvious in light of a combination of the teachings of Ohki and Joshi.

The comments above in relation to newly amended claim 1 are reiterated in relation to previously presented claim 5.

The Examiner asserts that in Joshi the heat sink is grounded and connected to a ground input of the chip. Applicant does not agree and traverses the Examiners assertion as follows.

Joshi does not provide any of the features lacking in Ohki. Neither citation discloses a heat conductive plate extending laterally out from between an integrated circuit and the substrate.

The required elements of previously presented claim 5 are not found in Ohki or Joshi or any valid combination thereof. Accordingly Applicant submits that previously presented claim 5 is non obvious over Ohki in view of Joshi.

Claim 19 (we presume that the Examiner means 19 not claim 9) stands rejected under 35 U.S.C. 103(a) as being unpatentable over Ohki in view of Papageorge et al. (US Patent No. 5,438,224, hereinafter "Papageorge"). More specifically, the Examiner has objected to dependent claim 19 as he considers this claim to be obvious in light of a combination of the teachings of Ohki and Papageorge.

The comments above in relation to newly amended claim 14 are reiterated in relation to previously presented claim 19.

The Examiner asserts that in Papageorge a plurality of bumps 159 on the underside of the substrate 150 are electrically coupled to the substrate contacts. Applicant does not agree and traverses the Examiners assertion as follows.

Papageorge does not provide any of the features lacking in Ohki. Neither citation discloses a heat conductive plate with a central portion and a plurality of arms extending outwardly from the central portion.

The required elements of previously presented claim 19 are not found in Ohki or Papageorge or any valid combination thereof. Accordingly, Applicant submits that previously presented claim 19 is non obvious over Ohki in view of Papageorge.

Claim 12 stands rejected under 35 U.S.C. 103(a) as being unpatentable over Ohki in view of Sano et al. (US Patent No. 5,952,714, hereinafter "Sano"). More specifically, the Examiner has objected to dependent claim 12 as he considers this claim to be obvious in light of a combination of the teachings of Ohki and Sano.

The comments above in relation to newly amended claim 10 are reiterated in relation to previously presented claim 12.

The Examiner has asserted that in Sano prior to securing the leadframe 24 to the substrate 42, a second chip 41 is mounted on the substrate, between a portion of leadframe 24 and the substrate. Applicant does not agree and traverses the Examiner's assertion as follows.

Sano does not provide any of the features lacking in Ohki. Sano does not disclose the chip 41 between the leadframe 24 and the substrate. Also there is no integrated circuit above the leadframe 24. In any case neither citation discloses a heat conductive plate extending laterally out from between a plurality of integrated circuits and the substrate. The leadframe asserted by the Examiner is simply that, it is not a portion of a heat conductive plate.

The required elements of previously presented claim 12 are not found in Ohki or Sano or any valid combination thereof. Accordingly Applicant submits that previously presented claim 12 is non obvious over Ohki in view of Sano.

When determining whether a combination of prior art documents is permitted, one must consider the evidence available.

The essential factual evidence on the issue of obviousness in the patent examination process centers on the prior art and the analysis thereof. When patentability turns on the question of obviousness, the search for and analysis of the prior art includes evidence relevant to the finding of whether there is a teaching, motivation, or suggestion to select and combine the references relied on as evidence of obviousness. A showing of a suggestion, teaching, or motivation to combine the prior art references is an essential component of an obviousness holding. The best defense against the subtle but powerful attraction of a hindsight-based obviousness analysis is rigorous application of the requirement for a showing of the teaching or motivation to combine prior art references. The Examiner must explain the reasons one of ordinary skill in the art would have been motivated to select the references and to combine them to render the claimed invention obvious. The Examiner can satisfy the burden of showing obviousness of the combination “only by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teachings of the references.

This factual question of motivation is material to patentability, and could not be resolved on subjective belief and unknown authority. It is improper, in determining whether a person of ordinary skill would have been led to this combination of references, simply to “[use] that which the inventor taught against its teacher.” Thus the Examiner must not only assure that the requisite findings are made, based on evidence of record, but must also explain the reasoning by which the findings are deemed to support the agency’s conclusion. Common knowledge and common sense are a not a substitute for evidence, but they may be applied to analysis of the evidence. Objective analysis, proper authority, and reasoned findings cannot be omitted.

Reference to common knowledge "does not in and of itself make it so" absent evidence of such knowledge.

The patent examination procedure serves both to find, and to place on the official record, that which has been considered with respect to patentability. The patent examiner is deemed to have experience in the field of the invention. However, this experience, insofar as applied to the determination of patentability, must be applied from the viewpoint of "the person having ordinary skill in the art of which said subject matter pertains". In finding the relevant facts, in assessing the significance of the prior art, and in making the ultimate determination of the issue of obviousness, the Examiner is presumed to act from this viewpoint. Thus when relying on what is assumed to be general knowledge to negate patentability, that knowledge must be articulated and placed on the record. The failure to do so is not consistent with either effective administrative procedure or effective judicial review (61 USPQ2D 1430 In re Lee).

The table below lists the US and International classes of the six references relied upon by the Examiner. Clearly Moden, Joshi, Papageorge and Sano are in vastly difference classes compared to Ohki. None of the combinations would be found in a single search by a skilled searcher. None of the documents refer to each other.

| CITATION | US CLASS | IPC CLASS |
|------------------|----------|-------------|
| Ohki et al | 438/122 | H01L 21/44 |
| Moden | 257/666 | H01L 23/495 |
| Ohsawa et al | 438/112 | H01L 21/44 |
| Joshi | 357/81 | H01L 23/02 |
| Papageorge et al | 257/777 | H01L 23/02 |
| Sano et al | 257/680 | H01L 23/02 |

As such it is most strongly submitted that the combination of Ohki and any of Moden, Joshi, Papageorge and Sano cannot be a valid combination and as such the obviousness argument of the Examiner should be rejected. Similarly, the combinations of Ohki and Ohsawa should also be rejected.

It is felt that full and complete response has been made to the office action, and Applicant respectfully submits that the pending claims are allowable over the cited art and that subject application is now in condition for allowance.

The fact that Applicant may not have specifically traversed any particular assertion by the Office should not be construed as indicating Applicant's agreement therewith.

Applicant has made a diligent effort to place the claims in condition for allowance. However, should there remain unresolved issues that require adverse action, it is respectfully requested that the Examiner telephone Ira S. Matsil, Applicant's attorney, at 972-732-1001 so that such issues may be resolved as expeditiously as possible. No fee is believed due in connection with this filing. However, should one be deemed due, the Commissioner is hereby authorized to charge Deposit Account No. 50-1065.

Respectfully submitted,

September 25, 2006

Date



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